IN THE TITLE:

Please replace the title on **page 1** to read as follows:

IMPROVED MULTI-LAYER GOLF BALL

IN THE SPECIFICATION:

Please replace the heading on **page 1 (above line 1)** to read as follows:

A1

Field of the Invention

Please replace the paragraph on **page 1, lines 1-7** to read as follows:

A2

This application is a continuation application of U.S. Application Serial No. 09/776,278 filed February 2, 2001, which is a continuation application of U.S. Application Serial No. 09/470,196 filed on December 21, 1999, now U.S. Patent No. 6,210,293, which is a continuation application of U.S. Application Serial No. 08/870,585 filed June 6, 1997, now abandoned which is a continuation of U.S. Application Serial No. 08/556,237 filed November 9, 1995, now abandoned, which is a continuation-in-part of U.S. Application Serial No. 08/070,510 filed on June 1, 1993, now abandoned.

RG 9-26-02

Please delete the heading on **page 1, line 8**:

Field of the Invention

A

Please replace paragraph on **page 2, lines 11-20** to read as follows:

A3

Ionomeric resins are polymers containing interchain ionic bonding. As a result of their toughness, durability and flight characteristics, various ionomeric resins sold by E. I. DuPont de Nemours & Company under the trademark Surlyn® and more recently, by the Exxon Corporation (see U. S. Patent No. 4,911,451) under the trademarks - "Escor®" and the trade name "Iotek®", have become the materials of choice for the construction of golf ball covers over the traditional "balata" (transpolyisoprene, natural or synthetic) rubbers. As stated, the softer balata covers, although exhibiting enhanced playability properties, lack the durability (cut and abrasion resistance, fatigue endurance, etc.) properties required for repetitive play.

Please replace the paragraph on **page 3, lines 21-26** to read as follows:

A4

In addition, multi-layered covers containing one or more ionomer resins have also been formulated in an attempt to produce a golf ball having the overall distance, playability and durability characteristics desired. For example, this was addressed by Spalding & Evenflo Companies, Inc., the assignee of the present invention, in U. S. Patent No. 4,431,193 where a multi-layered, regular sized, golf ball is disclosed.

Please replace the paragraphs on **page 4, line 31 to page 5, line 23** to read as follows:

A5

The present invention is directed to improved multi-layer golf ball cover compositions and the resulting multi-layer golf balls produced using the improved compositions. The novel multi-layer golf ball covers of the present invention include a first or inner layer or ply of a high acid (greater than 16 weight percent acid) ionomer blend or, more preferably, a low acid (16 weight percent acid or less)

ionomer blend and second or outer layer or ply comprised of a comparatively softer, low modulus ionomer, ionomer blend or other non-ionomeric thermoplastic or thermosetting elastomer such as polyurethane or polyester elastomer. The multi-layer golf balls of the invention can be of standard or enlarged size. Preferably, the inner layer or ply includes a blend of low acid ionomers and has a Shore D hardness of 60 or greater and the outer cover layer comprised of polyurethane and has a Shore D hardness of about 45 (i.e., Shore C hardness of about 65).

Please replace the paragraph on **page 6, lines 9-14** to read as follows:

A6

The combination of a low acid ionomer blend inner cover layer with a soft, relatively low modulus ionomer, polyurethane based elastomer outer cover layer provides for good overall coefficient of restitution (i.e., enhanced resilience) while at the same time demonstrating improved compression and spin. The outer cover layer generally contributes to a more desirable feel and spin, particularly at lower swing speeds with highly lofted clubs such as half wedge shots.

Please replace the title on **page 8, line 12** to read as follows:

A7

Detailed Description of the Invention

Please replace the paragraphs on **page 8, line 25 to page 9, line 10** to read as follows:

A8

The low acid ionomers which may be suitable for use in formulating the inner layer compositions of the subject invention are ionic copolymers which are the metal, i.e., sodium, zinc, magnesium, etc., salts of the reaction product of an olefin having from about 2 to 8 carbon atoms and an unsaturated monocarboxylic acid having from about 3 to 8 carbon atoms. Preferably, the ionomeric resins are copolymers of ethylene and either acrylic or methacrylic acid. In some circumstances, an additional comonomer such as an acrylate ester (i.e., iso- or n-butylacrylate, etc.) can also be included to produce a softer terpolymer. The

carboxylic acid groups of the copolymer are partially neutralized (i.e., approximately 10-75%, preferably 30-70%) by the metal ions. Each of the low acid ionomer resins which may be included in the inner layer cover compositions of the invention contains 16% by weight or less of a carboxylic acid.

The inner layer compositions include the low acid ionomers such as those developed and sold by E. I. DuPont de Nemours & Company under the trademark Surlyn® and by Exxon Corporation under the trademarks Escor® or tradename Iotek®, or blends thereof.

Please replace the paragraph on **page 10, lines 17-25** to read as follows:

A9

Preferably, the outer layer includes a blend of hard and soft (low acid) ionomer resins such as those described in U. S. Patent Nos. 4,884,814 and 5,120,791, both incorporated herein by reference. Specifically, a desirable material for use in molding the outer layer comprises a blend of a high modulus (hard), low acid, ionomer with a low modulus (soft) low acid, ionomer to form a base ionomer mixture. A high modulus ionomer herein is one which measures from about 15,000 to about 70,000 psi as measured in accordance with ASTM method D-790. The hardness may be defined as at least 50 on the Shore D scale as measured in accordance with ASTM method D-2240.

Please replace the paragraph on **page 10, line 29 to page 11, line 2** to read as follows:

A10

The hard ionomer resins utilized to produce the outer cover layer composition hard/soft blends include ionic copolymers which are the sodium, zinc, magnesium or lithium salts of the reaction product of an olefin having from 2 to 8 carbon atoms and an unsaturated monocarboxylic acid having from 3 to 8 carbon atoms. The carboxylic acid groups of the copolymer may be totally or partially (i.e. approximately 15-75 percent) neutralized.

Please replace the paragraphs on **page 11, lines 8-29** to read as follows:

A11

As discussed earlier herein, the hard ionomeric resins introduced under the designation Escor® and sold under the designation Iotek® are somewhat similar

to the hard ionomeric resins sold under the Surlyn® trademark. However, since the Iotek® ionomeric resins are sodium or zinc salts of poly(ethylene-acrylic acid) and the Surlyn® resins are zinc or sodium salts of poly(ethylene-methacrylic acid) some distinct differences in properties exist. As more specifically indicated in the data set forth below, the hard Iotek® resins (i.e., the acrylic acid based hard ionomer resins) are the more preferred hard resins for use in formulating the outer layer blends for use in the present invention. In addition, various blends of Iotek® and Surlyn® hard ionomeric resins, as well as other available ionomeric resins, may be utilized in the present invention in a similar manner.

A11

Examples of commercially available hard ionomeric resins which may be used in the present invention in formulating the inner and outer cover blends include the hard sodium ionic copolymer sold under the trademark Surlyn® 8940 and the hard zinc ionic copolymer sold under the trademark Surlyn® 9910. Surlyn® 8940 is a copolymer of ethylene with methacrylic acid and about 15 weight percent acid which is about 29 percent neutralized with sodium ions. This resin has an average melt flow index of about 2.8. Surlyn® 9910 is a copolymer of ethylene and methacrylic acid with about 15 weight percent acid which is about 58 percent neutralized with zinc ions. The average melt flow index of Surlyn® 9910 is about 0.7. The typical properties of Surlyn® 9910 and 8940 are set forth below in Table 1:

Please replace Table 1 on **page 12, lines 1-22** to read as follows:

TABLE 1

Typical Properties of Commercially Available Hard Surlyn® Resins Suitable for Use in the Inner and Outer Layer Blends of the Present Invention

A12

T6430

	ASTM D	8940	9910	8920	8528	9970	9730
Cation Type		Sodium	Zinc	Sodium	Sodium	Zinc	Zinc
Melt flow index, gms/10 min.	D-1238	2.8	0.7	0.9	1.3	14.0	1.6
Specific Gravity, g/cm^3	D-792	0.95	0.97	0.95	0.94	0.95	0.95
Hardness, Shore D	D-2240	66	64	66	60	62	63
Tensile Strength, (kpsi), MPa	D-638	(4.8) 33.1	(3.6) 24.8	(5.4) 37.2	(4.2) 29.0	(3.2) 22.0	(4.1) 28.0

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Elongation, %	D-638	470	290	350	450	460	460
Flexural Modulus, (kpsi) MPa	D-790	(51) 350	(48) 330	(55) 380	(32) 220	(28) 190	(30) 210
Tensile Impact (23°C) KJ/m_2 ($ft.-lbs./in^2$)	D-1822S	1020 (485)	1020 (485)	865 (410)	1160 (550)	760 (360)	1240 (590)
Vicat Softening Temperature, °C	D-1525	63	62	58	73	61	73

Please replace Table 2 on **page 13, line 1 to page 14, line 17** to read as follows:

TABLE 2

Typical Properties of Iotek® Ionomers

Resin Properties	ASTM Method	Units	4000	4010	8000	8020	8030
Cation type			zinc	zinc	sodium	sodium	sodium
Melt index	D-1238	g/10 min.	2.5	1.5	0.8	1.6	2.8
Density	D-1505	kg/m^3	963	963	954	960	960
Melting Point	D-3417	°C	90	90	90	87.5	87.5
Crystallization Point	D-3417	°C	62	64	56	53	55
Vicat Softening Point	D-1525	°C	62	63	61	64	67
% Weight Acrylic Acid			16		11		
% of Acid Groups cation neutralized			30		40		
Plaque Properties (3 mm thick, compression molded)	ASTM Method	Units	4000	4010	8000	8020	8030
Tensile at break	D-638	MPa	24	26	36	31.5	28
Yield point	D-638	MPa	none	none	21	21	23
Elongation at break	D-638	%	395	420	350	410	395
1% Secant modulus	D-638	MPa	160	160	300	350	390
Shore Hardness D	D-2240	--	55	55	61	58	59
Film Properties (50 micron film 2.2:1 Blow-up ratio)			4000	4010	8000	8020	8030
Tensile at Break MD	D-882	MPa	41	39	42	52	47.4
TD	D-882	MPa	37	38	38	38	40.5
Yield point MD	D-882	MPa	15	17	17	23	21.6

TD	D-882	MPa	14	15	15	21	20.7
Elongation at Break							
MD	D-882	%	310	270	260	295	305
TD	D-882	%	360	340	280	340	345
1% Secant modulus MD	D-882	MPa	210	215	390	380	380
TD	D-882	MPa	200	225	380	350	345
Dart Drop Impact	D-1709	g/micron	12.4	12.5	20.3		

Resin Properties Cation type	ASTM Method	Units	7010 zinc	7020 zinc	7030 zinc
Melt Index	D-1238	g/10 min.	0.8	1.5	2.5
Density	D-1505	kg/m^3	960	960	960
Melting Point	D-3417	°C	90	90	90
Crystallization Point	D-3417	°C	--	--	--
Vicat Softening Point	D-1525	°C	60	63	62.5
%Weight Acrylic Acid			--	--	--
% of Acid Groups Cation Neutralized			-	--	--

Plaque Properties (3 mm thick, compression molded)	ASTM Method	Units	7010	7020	7030
Tensile at break	D-638	MPa	38	38	38
Yield Point	D-638	MPa	none	none	none
Elongation at break	D-638	%	500	420	395
1% Secant modulus	D-638	MPa	--	--	--
Shore Hardness D	D-2240	--	57	55	55

A13

Please replace the paragraphs on **page 14, line 18 to page 15, line 2** to read as follows:

A14

Comparatively, soft ionomers are used in formulating the hard/soft blends of the inner and outer cover compositions. These ionomers include acrylic acid based soft ionomers. They are generally characterized as comprising sodium or zinc salts of a terpolymer of an olefin having from about 2 to 8 carbon atoms, acrylic acid, and an unsaturated monomer of the acrylate ester class having from 1 to 21 carbon atoms. The soft ionomer is preferably a zinc based ionomer made from

A

an acrylic acid base polymer in an unsaturated monomer of the acrylate ester class. The soft (low modulus) ionomers have a hardness from about 20 to about 40 as measured on the Shore D scale and a flexural modulus from about 1,000 to about 10,000, as measured in accordance with ASTM method D-790.

Certain ethylene-acrylic acid based soft ionomer resins developed by the Exxon Corporation under the designation Iotek® 7520 (referred to experimentally by differences in neutralization and melt indexes as LDX 195, LDX 196, LDX 218 and LDX 219) may be combined with known hard ionomers such as those indicated above to produce the inner and outer cover layers. The combination produces higher C.O.R.s at equal or softer hardness, higher melt flow (which corresponds to improved, more efficient molding, i.e., fewer rejects) as well as significant cost savings versus the inner and outer layers of multi-layer balls produced by other known hard-soft ionomer blends as a result of the lower overall raw materials costs and improved yields.

Please replace the paragraphs on **page 15, line 29 to page 16, line 12** to read as follows:

In addition, test data collected by the inventor indicates that Iotek® 7520 resins have Shore D hardnesses of about 32 to 36 (per ASTM D-2240), melt flow indexes of 3±0.5 g/10 min (at 190°C. per ASTM D-1288), and a flexural modulus of about 2500-3500 psi (per ASTM D-790). Furthermore, testing by an independent testing laboratory by pyrolysis mass spectrometry indicates that Iotek® 7520 resins are generally zinc salts of a terpolymer of ethylene, acrylic acid, and methyl acrylate.

Furthermore, the inventor has found that a newly developed grade of an acrylic acid based soft ionomer available from the Exxon Corporation under the designation Iotek® 7510, is also effective, when combined with the hard ionomers indicated above in producing golf ball covers exhibiting higher C.O.R. values at equal or softer hardness than those produced by known hard-soft ionomer blends. In this regard, Iotek® 7510 has the advantages (i.e. improved flow, higher C.O.R. values at equal hardness, increased clarity, etc.) produced by the Iotek® 7520 resin when compared to the methacrylic acid base soft ionomers known in the art (such as the

Elongation at Break	D412	%	490
Taber Abrasion	D460, H-18	mg/1000 cycles	350

Component[1] Properties	Part A (Isocyanate)	Part B (Resin)
Viscosity @ 25°C, mPa·s	2500	2100
Density @ 25°C, g/cm	1.08	1.09
NCO, %	9.80	----------
Hydroxyl Number, Mg KOH/g	----------	88

[1]Component A is a modified diphenylmethane diisocyanate (MDI) prepolymer and component B is a polyether polyol blend.

Please replace the paragraph on **page 20, lines 12-25** to read as follows:

The various cover composition layers of the present invention may be produced according to conventional melt blending procedures. In the case of the outer cover layer, when a blend of hard and soft, low acid ionomer resins are utilized, the hard ionomer resins are blended with the soft ionomeric resins and with a masterbatch containing the desired additives in a Banbury mixer, two-roll mill, or extruder prior to molding. The blended composition is then formed into slabs and maintained in such a state until molding is desired. Alternatively, a simple dry blend of the pelletized or granulated resins and color masterbatch may be prepared and fed directly into the injection molding machine where homogenization occurs in the mixing section of the barrel prior to injection into the mold. If necessary, further additives such as an inorganic filler, etc., may be added and uniformly mixed before initiation of the molding process. A similar process is utilized to formulate the low acid ionomer resin compositions used to produce the inner cover layer.

A16

Please replace the paragraph on **page 21, lines 18-22** to read as follows:

The resulting golf ball produced from the low acid ionomer resin inner layer and the relatively softer, low flexural modulus outer layer provide for an improved multi-layer golf ball which provides for desirable coefficient of restitution, compression, spin and durability properties while at the same time offering the feel

A17

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characteristics associated with soft balata and balata-like covers of the prior art.

Please replace the paragraph on **page 22, line 32 to page 23, line 2** to read as follows:

Coefficient of restitution (C.O.R.) was measured by firing the resulting golf ball in an air cannon at a velocity of 125 feet per second against a steel plate positioned 12 feet from the muzzle of the canon. The rebound velocity was then measured. The rebound velocity was divided by the forward velocity to give a coefficient of restitution.

Please replace the paragraph on **page 23, lines 28-30** to read as follows:

The purpose behind producing and testing the balls of Table 5 was to provide a subsequent comparison in properties with the multi-layer golf balls of the present invention.

Please replace the paragraph on **page 25, lines 3-18** to read as follows:

With the above in mind, an outer cover layer composition was blended together in accordance with conventional blending techniques. The outer layer composition used for this portion of the example is a relatively soft cover composition such as those listed in U.S. Patent No. 5,120,791. An example of such a soft cover composition is a 45% soft/55% hard low acid ionomer blend designated by the inventor as "TE-90". The composition of TE-90 is set forth as follows:

Outer Cover Layer Composition TE-90

Iotek® 8000	22.7 weight %
Iotek® 7030	22.7 weight %
Iotek® 7520	45.0 weight %
White MB[1]	9.6 weight %

[1]White MB consists of about 23.77 weight percent TiO_2; 0.22 weight percent Uvitex® OB, 0.03 weight percent Santonox® R, 0.05 weight percent Ultramarine Blue™ and 75.85 weight percent Iotek® 7030.

Please replace the paragraph on **page 26, lines 13-24** to read as follows:

As it will be noted in finished balls 1-4, by creating a multi-layer cover utilizing the high acid ionomer resins in the inner cover layer and the hard/soft low acid ionomer resin in the outer cover layer, higher compression and increased spin rates are noted over the single layer covers of Table 5. In addition, both the C.O.R. and the Shore C hardness are reduced over the respective single layer covers of Table 5. This was once again particularly true with respect to the multi-layered balls containing the high acid ionomer resin in the inner layer (i.e. finished balls 1-4). In addition, with the exception of prior art ball 5 (i.e. the '193 patent), resistance to cutting remains good but is slightly decreased. As noted above, the prior art ball of the '193 patent suffers substantially in durability (as well as in resiliency) in comparison to the balls of the invention.

Please replace Table 6B on **page 27, lines 10-23** to read as follows:

TABLE 6B
Finish Balls

Ingredients:	6	7
Inner Cover Layer Composition	A	D
Outer Cover Layer Composition	Estane® 4517	Surlyn® 9020
Properties of Molded Finished Balls:		
Compression	67	61
C.O.R.	.774	.757
Shore C Hardness	74	89
Spin (R.P.M.)	10,061	8,846
Cut Resistance	3-4	1-2

Please replace the paragraph on **page 30, lines 1-9** to read as follows:

In this regard, Top Grade or TG is a low acid inner cover ionomer resin blend comprising of 70.6% Iotek® 8000, 19.9% Iotek® 7010 and 9.6% white masterbatch. "959/960" is a 50/50 wt/wt blend of Iotek® 959/960. In this regard, Escor® or Iotek® 959 is a sodium ion neutralized ethylene-acrylic neutralized ethylene-acrylic acid copolymer. According to Exxon, Ioteks® 959 and 960 contain

from about 19.0 to about 21.0% by weight acrylic acid with approximately 30 to about 70 percent of the acid groups neutralized with sodium and zinc ions, respectively. The physical properties of these high acid acrylic acid based ionomers are as follows:

Please replace the paragraph on **page 30, line 29 to page 31, line 6** to read as follows:

The data clearly indicates that higher C.O.R. and hence increase travel distance can be obtained by using multi-layered covered balls versus balls covered with single layers. However, some sacrifices in compression and spin are also noted. Further, as shown in comparing Example Nos. 12 vs. 13, Example Nos. 17 vs. 16, etc., use of lower acid level inner cover layers and relatively soft outer cover layers (i.e., 50 wt. % or more soft ionomer) produces softer compression and higher spin rates than the golf balls comprised of high acid inner cover layers. Consequently, use of blends of low acid ionomer resins to produce the inner layer of a multi-layer covered golf ball produces not only enhanced travel distance but also enhanced compression and spin properties.

A24

Please replace the paragraph on **page 32, lines 22-30** to read as follows:

The mantle core is 1.57" and fits snugly in the 1.57" cavity. The hose clamp is attached to the 1.57" cavity and a mantle core is placed in inside. Urethane is mixed and poured into one of the dimpled cavities and the two halves are placed together and clamped, forcing out excess material and forming half the cover. The hose clamp is used to keep the two mold halves aligned during curing. When the cover material is set up enough (about 5 minutes), the two halves are separated and the 1.57" mold is replaced with the other 1.68" mold and the process is repeated. Both halves of the cover are now cast and the entire assemble is placed in an 125°F oven for 1 hour after which it can be opened and the ball removed.

A25

Please replace Table 9 on **page 33, lines 1-23** to read as follows:

TABLE 9

	23	23	24	25	26	27	28	29
Core Data								
Size	1.47"	1.47"	1.47"	1.47"	1.47	1.47"	1.47"	1.47"
Weight	32.2	32	32.2	32	37.7	32.2	32	32.2
Comp	82	58	82	58	85	82	58	82
COR	768	772	768	772	794	768	772	768
Mantle Data	Iotek®	Iotek®	Iotek®	Iotek®		Iotek®	Iotek®	Iotek®
Material	8030/7030	8030/7030	8030/7030	8030/7030	None	8030/7030	8030/7030	8030/7030
Weight	37.8	38.1	37.9	38.1		37.8	38.1	37.9
Size	1.57"	1.57"	1.57"	1.57"		1.57"	1.57"	1.57"
Comp	70	48	69	48		70	48	69
COR	781	785	786	788		781	785	786
Ball Data								
Cover Material	Baytec® RE832	Baytec® RE832	Baytec® RE832	Baytec® RE832	Z-Balata	Z-Balata	Z-Balata	Z-Balata
Weight	45.4	45.5	45.5	45.2	45.3	44.8	45	
Comp	75	64	73	60	80	66	50	65
COR	771	763	770	761	792	775	774	778
Shore C	65	65	65	65	84	84	84	84
Spin (rpm)	9560	8789	9285	8760	8796	8702	9072	8643
Cut (1-good, 4-poor)	2	2	2	1.5	2	2	2	2
Scuff (1-good, 4-poor)	1.5	1.5	1.5	1.5	2	3	3	3

Please replace the paragraph on **page 34, lines 12-17** to read as follows:

A27

The invention has been described with reference to the preferred embodiment. Obviously, modifications and alterations will occur to others upon reading and understanding the preceding detailed description. It is intended that the invention be construed as including all such modifications and alterations insofar as they come within the scope of the appended claims or the equivalents thereof.

IN THE CLAIMS:

Please delete claims 2 to 3, 7 and 12 to 14 without prejudice or disclaimer of the subject matter contained therein.

Please amend claims 1, 6, 8, 11 and 15 as follows:

1. (Amended) A golf ball comprising:

a core;

A28

an inner cover layer disposed on said core, said inner cover layer having a Shore D hardness of at least 60, said inner cover layer comprising a blend of two or more low acid ionomer resins, each containing no more than 16% by weight of an alpha, beta-unsaturated carboxylic acid; and

an outer cover layer disposed on said inner cover layer, said outer cover layer having a Shore D hardness of about 64 or less, a thickness of from about 0.01 to about 0.07 inches, and comprising a polyurethane material.

B2

~~6.~~ (Amended) A golf ball comprising:

a core;

A29

an inner cover layer disposed about said core, said inner cover layer having a Shore D hardness of at least 60, said inner cover layer comprising a blend of two or more ionomeric resins, each containing no more than 16% by weight of an alpha, beta-unsaturated carboxylic acid; and

an outer cover layer disposed on said inner cover layer, said outer cover layer having a thickness of from about 0.01 to about 0.07 inches, and

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A30 8. 5 (Amended) The golf ball of claim 6 4 wherein said outer cover exhibits a Shore D hardness of about 64 or less.

Sub B3 11. (Amended) A golf ball comprising:

a core;

A31 an inner cover layer disposed on said core, said inner cover layer having a Shore D hardness of about 60 or more, said inner cover layer comprising an ionomeric resin including no more than 16% by weight of an alpha, beta-unsaturated carboxylic acid and having a modulus of greater than about 15,000 psi; and

an outer cover layer disposed about said inner cover layer, said outer cover layer having a thickness of from about 0.01 to about 0.07 inches, and comprising a polyurethane material.

A32 15. 9 (Amended) The golf ball of claim 11 8 wherein said outer cover exhibits a Shore D hardness of about 64 or less.

IN THE ABSTRACT:

Please replace the title on **page 38** to read as follows:

IMPROVED MULTI-LAYER GOLF BALL